Math 210A Complex Analysis

Textbook: John B. Conway, Functions of One Complex Variable I. Springer
Reference: Lars V. Ahlfors, Complex Analysis. McGraw-Hill, Inc.

Pre-requisites:
- Chapter I. The Complex Number System
- Chapter II. Metric Spaces and the Topology of C

Week 1:   Chapter III
- Complex differentiability, Analytic functions and Examples
- Cauchy-Riemann equations
- Power series
- MöbiusTransformations and conformal maps

Week 2-6:   Chapter IV
- Complex integration
- Cauchy's theorem
- Cauchy's integral formula, inequalities and Cauchy estimate
- Power series representation of analytic functions,

Week 7-8:   Chapter IV
- Liouville's theorem, Fundamental theorem of Algebra, Morera Theorem
- Maximum modulus principle, Winding number
- Open mapping theorem
- Goursat's theorem

Weeks 9-10:   Chapter V
- Classification of singularities, Casorati-Weierstrass theorem
- Laurent series, Residue Theorem
- Evaluation of definite integrals
- Argument principle, Rouche's theorem

Math 210B Complex Analysis

Textbook: John B. Conway, Functions ofOone Complex Variable I. Springer
Reference: Lars V. Ahlfors, Complex Analysis. McGraw-Hill, Inc.

Pre-requisites: Math 210A

Week 1:   Review

Week 2-3:   Chapter VI
- Maximum Modulus Theorem
- Schwarz's lemma
- Automorphism group of the unit disk.

Week 4-6:   Chapter VII
- Normal family of analytic functions
- Montel's Theorem
- The Riemann Mapping Theorem

Week 7-9:   Chapter X
- Harmonic functions
- Dirichlet problem
- Poisson kernel and boundary values problems on the unit disc
- Harnack's Theorem

Weeks 10:   Chapter XI
- Jensen and Poisson-Jensen formulas for entire functions

Math 210C Complex Analysis (Riemann Surfaces)

Textbooks: 1. Riemann Surfaces (Oxford Graduate Texts in Mathematics, 22) by Simon Donaldson, 2011.
2. A Concise Course in Complex Analysis and Riemann Surfaces (Graduate Studies in Mathematics, 154, American Mathematical Society) by Wilhelm Schlag

Pre-requisites: Math 210B

Week 1:   Chapters 1, 2 (Donaldson)
- Holomorphic Functions
- Surface Topology

Week 2:   Chapters 3, 4 (Donaldson)
- Riemann Surfaces
- Holomorphic Mappings

Week 3:   Chapter 5 (Donaldson)
- Calculus on Surfaces

Week 4:   Chapter 7 (Donaldson)
- Applications of the Euler Characteristic

Weeks 5 – 7:   Chapters 8, 9 (Donaldson)
- Meromorphic Functions
- The Main Theorem for Compact Riemann Surfaces
- The Riemann-Roch Formula

Weeks 8 – 10:   Chapter 10 (Donaldson)
- The Uniformization Theorem of Riemann surfaces.

Optional: Selected topics from chapters 11 – 14 (Donaldson) if time permits
- Hyperbolic Geometry on Surfaces
- Divisors, Line Bundles and Jacobians
- Moduli and Deformations